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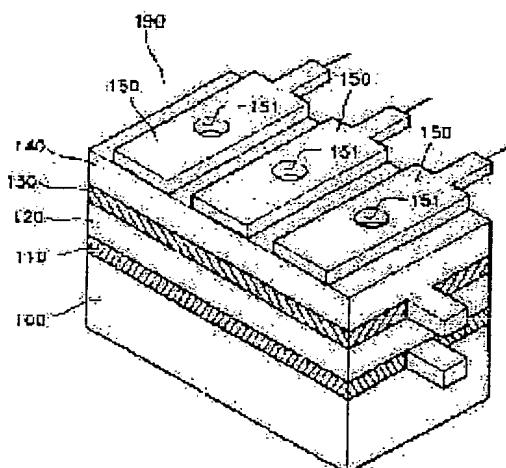
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## 54) CATHODE STRUCTURE USING FERRO-DIELECTRIC Emitter AND ELECTRON GUN AND CATHODE-RAY TUBE USING CATHODE STRUCTURE

## 57) Abstract:

PROBLEM TO BE SOLVED: To facilitate fabrication, simplify the structure, and lessen deterioration of the cathode substance resulting from ion bombardment even in the low vacuum state.

SOLUTION: A cathode structure concerned comprises a substrate 100, lower electrode layer 110 formed on the substrate 100, a ferro-dielectric cathode layer 120 with a ferro-dielectric emitter formed on the lower electrode layer 110, an upper electrode layer 130 to provide an electron emission region from the surface of the cathode layer 120, and a drive electrode layer 150 which is formed on the electrode layer 30 and controls electrons emitted from the electron emission region of the upper electrode layer 130. Accordingly the deterioration of the cathode substance due to ion bombardment can be lessened even in the low vacuum state.



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(54)【発明の名称】強誘電性エミッターを適用した陰極構造体及びこれを適用した電子銃並びに陰極線管

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(57)【特許請求の範囲】

【請求項1】 基板と、  
 基板上に形成される下部電極層と、  
 前記下部電極層上に形成される強誘電性エミッターを適用した陰極層と、  
 前記強誘電性陰極層上に形成され、強誘電性陰極層表面  
 からの電子放出領域を供する上部電極層と、  
 前記電極層上に形成されて前記上部電極層の電子放出領域から放出される電子を制御する3つの駆動電極とを具備し、  
 前記各駆動電極は電子が通過する貫通孔をそれぞれ有し、  
 前記駆動電極に対応する前記上部電極の部位には各貫通孔に対応する多数の微細孔が形成されていることを特徴とする強誘電性エミッターを適用した陰極構造体。

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【請求項2】 前記貫通孔の直径は300 マイクロメートル以下であることを特徴とする請求項1に記載の強誘電性エミッターを適用した陰極構造体。

【請求項3】 前記強誘電性陰極層の素材はPZT 又はPLZTであることを特徴とする請求項1に記載の強誘電性エミッターを適用した陰極構造体。

【請求項4】 前記強誘電性陰極層の素材はPZT 又はPLZTであることを特徴とする請求項2に記載の強誘電性エミッターを適用した陰極構造体。

10 【請求項5】 前記強誘電性陰極層の厚さは1 マイクロメートル乃至100 マイクロメートル内の範囲であることを特徴とする請求項1に記載の強誘電性エミッターを適用した陰極構造体。

【請求項6】 前記強誘電性陰極層の厚さは1 マイクロメートル乃至100 マイクロメートル内の範囲であること

を特徴とする請求項2に記載の強誘電性エミッターを適用した陰極構造体。

【請求項7】 前記強誘電性陰極層の厚さは1マイクロメートル乃至100マイクロメートル内の範囲であることを特徴とする請求項3に記載の強誘電性エミッターを適用した陰極構造体。

【請求項8】 前記強誘電性陰極層の厚さは1マイクロメートル乃至100マイクロメートル内の範囲であることを特徴とする請求項4に記載の強誘電性エミッターを適用した陰極構造体。

【請求項9】 請求項1に記載の陰極構造体と、前記電子放出源からの電子を制御及び加速する多数の電極を具備する電極群と、前記電子放出源と前記電極群を支持かつ固定する支持手段と、  
を具備することを特徴とする電子銃。

【請求項10】 前記貫通孔の直径は300マイクロメートル以下であることを特徴とする請求項9に記載の電子銃。

【請求項11】 前記強誘電性陰極層の素材はPZT又はPLZTであることを特徴とする請求項9に記載の電子銃。

【請求項12】 前記強誘電性陰極層の素材はPZT又はPLZTであることを特徴とする請求項10に記載の電子銃。

【請求項13】 前記強誘電性陰極層の厚さは1マイクロメートル乃至100マイクロメートル内の範囲であることを特徴とする請求項9に記載の電子銃。

【請求項14】 前記強誘電性陰極層の厚さは1マイクロメートル乃至100マイクロメートル内の範囲であることを特徴とする請求項10に記載の電子銃。

【請求項15】 前記強誘電性陰極層の厚さは1マイクロメートル乃至100マイクロメートル内の範囲であることを特徴とする請求項11に記載の電子銃。

【請求項16】 前記強誘電性陰極層の厚さは1マイクロメートル乃至100マイクロメートル内の範囲であることを特徴とする請求項12に記載の電子銃。

【請求項17】 請求項9に記載の電子放出源と多数の電極を具備した電子銃と、前記電子銃の装着されるネック部を具備するファンネルと、前記電子銃からの電子ビームにより画像を実現するスクリーンを具備したパネルと、  
を具備することを特徴とする陰極線管。

【請求項18】 前記貫通孔の直径は300マイクロメートル以下であることを特徴とする請求項17に記載の陰極線管。

【請求項19】 前記強誘電性陰極層の素材はPZT又はPLZTであることを特徴とする請求項17に記載の陰極線管。

【請求項20】 前記強誘電性陰極層の素材はPZT又は

PLZTであることを特徴とする請求項18に記載の陰極線管。

【請求項21】 前記強誘電性陰極層の厚さは1マイクロメートル乃至100マイクロメートル内の範囲であることを特徴とする請求項17に記載の陰極線管。

【請求項22】 前記強誘電性陰極層の厚さは1マイクロメートル乃至100マイクロメートル内の範囲であることを特徴とする請求項18に記載の陰極線管。

【請求項23】 前記強誘電性陰極層の厚さは1マイクロメートル乃至100マイクロメートル内の範囲であることを特徴とする請求項19に記載の陰極線管。

【請求項24】 前記強誘電性陰極層の厚さは1マイクロメートル乃至100マイクロメートル内の範囲であることを特徴とする請求項20に記載の陰極線管。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は強誘電性エミッターを適用した陰極構造体及びこれを適用した電子銃及び陰極線管に係り、特に電子放出源として強誘電性エミッターを使用する強誘電性エミッターを適用した陰極構造体及びこれを適用した電子銃並びに陰極線管に関する。

【0002】

【従来の技術】 一般に陰極線管に用いられる陰極構造体は熱的に励起されたBa酸化物のような陰極物質から電子を放出する。このような陰極構造体は陰極物質を加熱するための熱源、例えばフィラメントを備えており、フィラメントによる陰極物質の加熱方式により直熱型と放熱型とに分けられる。

【0003】 電子銃から放出された熱電子が活潑にスクリーンに進み、かつイオン衝撃による陰極物質の劣化を防止するためには、陰極線管の内部が高真空の状態を保たなければならない。

【0004】 一般に陰極線管の製造過程では陰極物質から熱電子が円滑に放出されるように、いわゆる排気工程及びエージング工程などの一連の製造過程を経る。

【0005】 しかし、従来では、排気及びエージング工程に相当の時間がかかるうえ、工程中に発生するイオン衝撃により陰極物質が劣化するなどの問題点があった。

【0006】

【発明が解決しようとする課題】 本発明は前記のような従来の問題点を解決するためになされたものであり、低真空の状態下でもイオン衝撃による陰極物質の劣化が少ない強誘電性エミッターを適用した陰極構造体及びこれを適用した電子銃並びに陰極線管を提供することにその目的がある。

【0007】 また、本発明の他の目的は、製作が容易で、構造が簡単な強誘電性エミッターを適用した陰極構造体及びこれを適用した電子銃及び陰極線管を提供することである。

【0008】

【課題を解決するための手段】前記の目的を達成するために、本発明による陰極構造体は、基板と、基板上に形成される下部電極層と、前記下部電極層上に形成される強誘電性エミッターを適用した陰極層と、前記強誘電性陰極層上に形成され、強誘電性陰極層表面からの電子放出領域を供する上部電極層と、前記電極層上に形成されて前記上部電極層の電子放出領域から放出される電子を制御する3つの駆動電極とを具備し、前記各駆動電極は電子が通過する貫通孔をそれぞれ有し、前記駆動電極に対応する前記上部電極の部位には各貫通孔に対応する多数の微細孔が形成されていることを特徴とする。

【0009】また、前記目的を達成するために、本発明による電子銃は、前記陰極構造体と、前記電子放出源からの電子を制御及び加速する多数の電極を具備する電極群と、前記電子放出源と前記電極群を支持かつ固定する支持手段とを具備することを特徴とする。

【0010】また、前記目的を達成するために、本発明による陰極線管は、前記電子銃と、前記電子銃の装着されるネック部を具備するファンネルと、前記電子銃からの電子ビームにより画像を実現するスクリーンを具備したパネルとを具備することを特徴とする。

【0011】前記本発明において、前記電子放出領域を3つ設けてカラー画像実現のための3つの電子ビームを得ることが望ましく、特に前記駆動電極に電子が通過する通過孔を設けることが望ましい。

【0012】また、前記強誘電性陰極の素材としてはPZT又はPLZTのうち何れか一つを適用することが望ましい。

### 【0013】

【発明の実施の形態】以下、本発明を添付した図面に基づき更に詳細に説明する。

【0014】本発明の陰極構造体の基本概念を説明するための図1を参照すると、120は電子放出源の強誘電性陰極層であり、110と130は強誘電性陰極層を励起させるための上下電極層である。

【0015】下部電極層110と上部電極層130にサブマイクロ秒の高圧パルスを印加すると、強誘電性陰極層120の内部及び表面に自発分極をスイッチするようになり、強い電子の放出が招かれる。ここで、電子は上部電極の形成されていない露出部位から放出される。

【0016】具体化された本発明による陰極構造体の概略的な斜視図を示す図2および図2の断面図を示す図3を参照すると、基板100の表面に最下位の下部電極層110が形成され、その上に強誘電性エミッターを適用した陰極層120、上部電極層130、絶縁層140、駆動電極層150が順次に形成されている。

【0017】前記のような構造の陰極構造体は、カラー陰極線管に用いられるように3つの電子放出領域を有する。具体的に、前記上部電極層130と下部電極層110はそれぞれ一つずつ設けられて強誘電性陰極層120全体を

励起させ得るようになっている。

【0018】前記絶縁層140の上には3つの駆動電極層150が一定間隔を隔てて設けられている。そして、各駆動電極層150には電子放出及び制御のための貫通孔151が形成されている。ここで、前記各駆動電極層150の各貫通孔151に対応する前記上部電極層130の部位には、図4に示すように、熱電子の放出のための微細孔131が形成されているため、これを通じて電子が前記駆動電極層150の貫通孔151へと進むようになっている。

【0019】前記駆動電極層150は画像信号などの制御信号を受け取り、電子を放出するか否かを決定し、かつ電子放出量を制御する。

【0020】かかる構造の本発明の陰極構造体において、前記強誘電性陰極層120の素材としては、強誘電性物質として公知のPZT、PLZTなどが用いられる。また、前記上部電極層130及び下部電極層110の素材としては、アルミニウム、金、白金などの高電導性金属が用いられる。

【0021】また、実験の結果、前記強誘電性陰極層120から電子を放出させるための駆動電圧は100ボルト以下の低いパルス電位を有する場合には、電流の漏れが少なく安定的な電子放出が起こるということが分かった。特に、駆動電圧は強誘電性陰極層の材料状態、例えば材料の結晶相や厚さなどに依存する。実験によると、駆動パルスの電圧を100ボルト以下に下げるために強誘電性陰極層120、例えばPLZTの厚さ、即ち上下電極層130,110間の間隔を10マイクロメートル以下に設定する必要がある。

【0022】駆動電圧は陰極層が薄ければ薄いほど低くなるが、約1マイクロメートル以下になると上下電極層間の短絡が発生するので、1マイクロメートル以上にならなければならない。また、駆動電圧は電子放出領域の大きさ、即ち駆動電極層に形成された貫通孔の直径にも依存する。実験によると、300マイクロメートル以下にしてから漸く100ボルト以下の状態で安定的な電子放出が可能になった。

【0023】前記のような構造の本発明の陰極構造体の製作方法は次の通りである。

【0024】図5に示されたように、結晶化ガラスからなる基板100の表面に、まず金ペーストを印刷法にて形成した後、所定時間だけ塑性化させて下部電極層110を得る。

【0025】下部電極層110が完成されると、図6に示されたように、ペースト化されたPZT又はPLZTを20マイクロメートルの厚さで印刷法にて形成し、再び塑性過程を経て強誘電性陰極層120を形成する。

【0026】図7に示されたように、前記強誘電性陰極層120上に金ペーストを印刷法にて積層し、これを塑性して上部電極層130を形成する。この際、上部電極層130は図4に示されたようなパターン、即ち多数の微細孔

131 を有する。

【0027】図8に示されたように、印刷法を用いて絶縁層140及び駆動電極層150を形成すると、所望の陰極構造体が得られる。ここで、前記絶縁層140と駆動電極層150は前記上部電極層130の微細孔131に対応する貫通孔を有する。

【0028】また、本発明による陰極構造体を製作するために、前述した印刷法以外の方法を用いることもできる。例えば、電極層の形成において、スパッタリング法、ドクター・ブレード法などを適用することもでき、強誘電性陰極層を形成するためにはバルク状に強誘電性シートを製作してから、この一側面に電極層をコーティングした後、これをアクリル樹脂にてモールディングし、他面を所定の厚さでポリシングした後、基板に付着させる。

【0029】図9は本発明の陰極構造体が適用された本発明の電子銃の概略的な側面構造を示したものである。

【0030】この電子銃900は一つの主レンズを有し、かつ前述したような陰極構造体190と、制御電極G1と、スクリーン電極G2と、フォーカス電極G3及び加速電極G4とが順番に並んでおり、これらはガラスピード800により一つに結合されている。820は本発明の陰極構造体を前記ガラスピード800に固定させるための固定片であり、このような固定片は多様な形態に変更できる。

【0031】前述したように、本発明による電子銃は单一の主レンズを有する単電子銃の構造において、熱電子放出源の放熱型陰極構造体が本発明の陰極構造体に取り替えられた構造を有する。

【0032】図10は前述した本発明の電子銃を具備した本発明による陰極線管を概略的に示した図面であり、既存構造の陰極線管において、従来の構造の電子銃が本発明の電子銃900に取り替わった構造を有する。

【0033】全体的な構造は、電子銃900が内蔵され、その外周に偏向ヨーク320が設けられるネック310を有するファンネル300と、内側面にスクリーン410の形成されたパネル400とが相互結合されて一つの真空容器が構成される。前記パネル400のスクリーン410から所定距離離隔された位置にはシャドーマスク420と内側シールド440が設けられており、これらはパネル400に固定されているフレーム430で支持されている。

【0034】前記のような構造を有する本発明の陰極線管の組立が終了したら、陰極構造体を最適化するための排気及びエージング工程を経るようになるが、従来の陰極構造体を適用した陰極線管の場合には約4時間がかかるのに対して、本発明による陰極線管の場合にはたった2時間内に排気及びエージング工程が終了した。また、実験によると、排気時の真空度を従来の陰極線管よりも一段階程度下げても陰極構造体が損なわれなかつた。

【0035】

【発明の効果】本発明による陰極線管は強誘電性陰極層を適用することにより、排気及びエージング工程が技術的に単純化され、従って低コストとなる。その上に、フィラメントのような熱源を使用しないために部品のコストが下がり、特に熱源による陰極構造体とこれに隣接した要素の熱的変形を抑制することができる。また、電子放出方法が瞬間的なパルスにより行われるので、熱電子の放出がすばやく行われる。

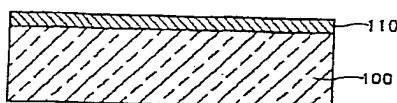
【図面の簡単な説明】

10 【図1】本発明による陰極構造体を概略的に示した図。  
 【図2】本発明による陰極構造体を概略的に示した斜視図。  
 【図3】図2に示された本発明による陰極構造体の断面図。  
 【図4】図2に示された本発明による陰極構造体の上部電極の一部拡大平面図。  
 【図5】本発明による陰極構造体の制作工程図。  
 【図6】本発明による陰極構造体の制作工程図。  
 【図7】本発明による陰極構造体の制作工程図。  
 20 【図8】本発明による陰極構造体の制作工程図。  
 【図9】本発明の陰極構造体が適用された本発明による電子銃の一実施例を示した概略断面図。  
 【図10】本発明の電子銃が適用された本発明による陰極線管の概略断面図。

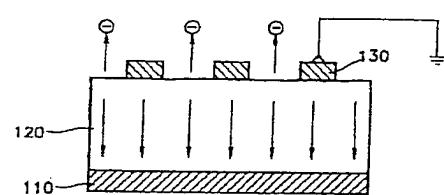
【符号の説明】

100	基板
110	下部電極
120	強誘電性陰極層
130	上部電極
30 131	微細孔
140	絶縁層
150	駆動電極層
151	貫通孔
190	陰極構造体
300	ファンネル
310	ネック
320	偏向ヨーク
400	パネル
410	スクリーン
40 420	シャドーマスク
430	フレーム
440	内側シールド
800	ガラスピード
820	固定片
900	電子銃
G1	制御電極
G2	スクリーン電極
G3	フォーカス電極
G4	加速電極

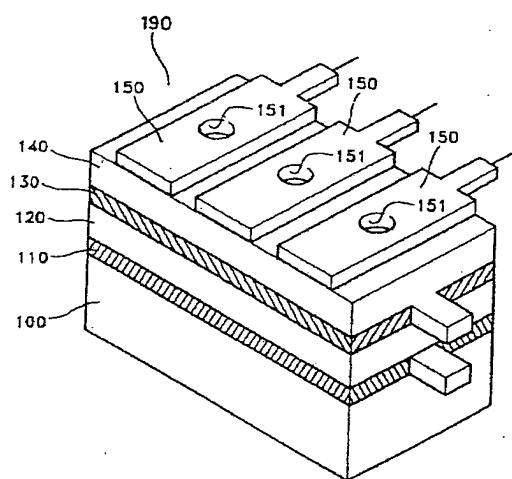
【図5】



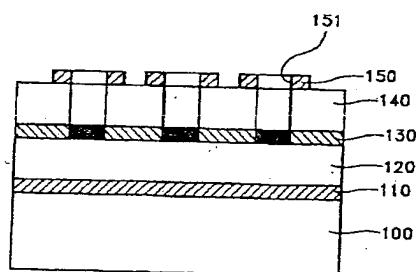
【図1】



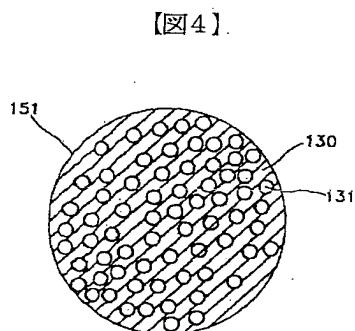
【図2】



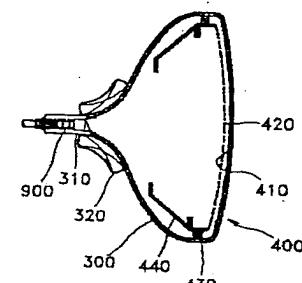
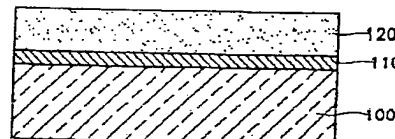
【図3】



【図10】

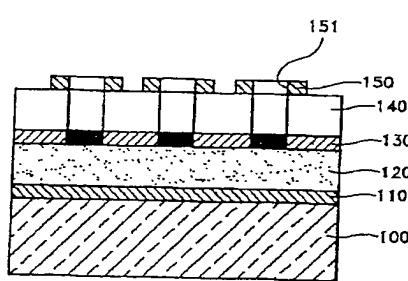
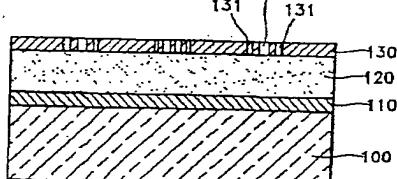


【図6】

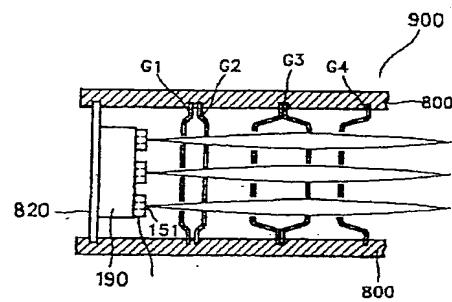


【図8】

【図7】



【図9】



フロントページの続き

(56)参考文献 特開 平5-325777 (J P, A)  
特開 平6-283092 (J P, A)  
特開 平8-203418 (J P, A)

(58)調査した分野(Int.Cl.7, DB名)  
H01J 1/30  
H01J 29/50

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## LAIMS

## Claim(s)]

Claim 1] The cathode structure which is characterized by providing the following and which applied the ferroelectricity emitter. Substrate. The lower electrode layer formed on a substrate. The catholyte which applied the ferroelectricity emitter formed on the aforementioned lower electrode layer. The drive electrode which controls the electron which is formed on the aforementioned ferroelectricity catholyte, is formed on the up electrode layer which offers the electron emission field from a ferroelectricity catholyte front face, and the aforementioned electrode layer, and is emitted from the electron emission field of the aforementioned up electrode layer.

Claim 2] It is the cathode structure which applied the ferroelectricity emitter according to claim 1 characterized by for the aforementioned drive electrode consisting of three drive electrodes, and for each drive electrode having the reakthrough which an electron passes, respectively, and forming the micropore of a large number corresponding to each breakthrough in the part of the aforementioned up electrode corresponding to the aforementioned drive electrode.

Claim 3] The diameter of the aforementioned breakthrough is 300. The cathode structure which applied the ferroelectricity emitter according to claim 2 characterized by being below MAIKUROMETORU.

Claim 4] The material of the aforementioned ferroelectricity catholyte is PZT. Or the cathode structure which applied the ferroelectricity emitter according to claim 1 characterized by being PLZT.

Claim 5] The material of the aforementioned ferroelectricity catholyte is PZT. Or the cathode structure which applied the ferroelectricity emitter according to claim 2 characterized by being PLZT.

Claim 6] The material of the aforementioned ferroelectricity catholyte is PZT. Or the cathode structure which applied the ferroelectricity emitter according to claim 3 characterized by being PLZT.

Claim 7] The thickness of the aforementioned ferroelectricity catholyte is 1. MAIKUROMETORU or 100 The cathode structure which applied the ferroelectricity emitter according to claim 1 characterized by being a range in MAIKUROMETORU.

Claim 8] The thickness of the aforementioned ferroelectricity catholyte is 1. MAIKUROMETORU or 100 The cathode structure which applied the ferroelectricity emitter according to claim 2 characterized by being a range in MAIKUROMETORU.

Claim 9] The thickness of the aforementioned ferroelectricity catholyte is 1. MAIKUROMETORU or 100 The cathode structure which applied the ferroelectricity emitter according to claim 3 characterized by being a range in MAIKUROMETORU.

Claim 10] The thickness of the aforementioned ferroelectricity catholyte is 1. The cathode structure which applied the ferroelectricity emitter according to claim 4 characterized by being a range in MAIKUROMETORU or 100 micrometers.

Claim 11] The thickness of the aforementioned ferroelectricity catholyte is 1. The cathode structure which applied the ferroelectricity emitter according to claim 5 characterized by being a range in MAIKUROMETORU or 100 micrometers.

Claim 12] The thickness of the aforementioned ferroelectricity catholyte is 1. The cathode structure which applied the ferroelectricity emitter according to claim 6 characterized by being a range in MAIKUROMETORU or 100 micrometers.

Claim 13] The electron gun characterized by providing the electrode group possessing the electrode of a large number which control and accelerate the electron from the cathode structure and the aforementioned source of electron emission of a publication to the aforementioned claim 1, and the aforementioned source of electron emission and the support means which support and fix the aforementioned electrode group.

Claim 14] It is the electron gun according to claim 13 characterized by for the aforementioned drive electrode

nsisting of three drive electrodes, and for each drive electrode having the breakthrough which an electron passes, spectively, and forming the micropore of a large number corresponding to each breakthrough in the part of the orementioned up electrode corresponding to the aforementioned drive electrode.

Claim 15] The diameter of the aforementioned breakthrough is 300. Electron gun according to claim 14 characterized , being below the micrometer.

Claim 16] The material of the aforementioned ferroelectricity catholyte is PZT. Or electron gun according to claim 13 aracterized by being PLZT.

Claim 17] The material of the aforementioned ferroelectricity catholyte is PZT. Or electron gun according to claim 14 aracterized by being PLZT.

Claim 18] The material of the aforementioned ferroelectricity catholyte is PZT. Or electron gun according to claim 15 aracterized by being PLZT.

Claim 19] The thickness of the aforementioned ferroelectricity catholyte is 1. Electron gun according to claim 13 aracterized by being a range in MAIKUROMETORU or 100 micrometers.

Claim 20] The thickness of the aforementioned ferroelectricity catholyte is 1. Electron gun according to claim 14 aracterized by being a range in MAIKUROMETORU or 100 micrometers.

Claim 21] The thickness of the aforementioned ferroelectricity catholyte is 1. Electron gun according to claim 15 aracterized by being a range in MAIKUROMETORU or 100 micrometers.

Claim 22] The thickness of the aforementioned ferroelectricity catholyte is 1. Electron gun according to claim 16 aracterized by being a range in MAIKUROMETORU or 100 micrometers.

Claim 23] The thickness of the aforementioned ferroelectricity catholyte is 1. Electron gun according to claim 17 aracterized by being a range in MAIKUROMETORU or 100 micrometers.

Claim 24] The thickness of the aforementioned ferroelectricity catholyte is 1. Electron gun according to claim 18 aracterized by being a range in MAIKUROMETORU or 100 micrometers.

Claim 25] The cathode-ray tube characterized by providing the source of electron emission given in the orementioned claim 13, the electron gun possessing many electrodes, the funnel possessing the neck section by which is equipped with the aforementioned electron gun, and the panel possessing the screen which realizes a picture with e electron beam from the aforementioned electron gun.

Claim 26] It is the cathode-ray tube according to claim 25 characterized by for the aforementioned drive electrode nsisting of three drive electrodes, and for each drive electrode having the breakthrough which an electron passes, spectively, and forming the micropore of a large number corresponding to each breakthrough in the part of the orementioned up electrode corresponding to the aforementioned drive electrode.

Claim 27] The diameter of the aforementioned breakthrough is 300. Cathode-ray tube according to claim 26 aracterized by being below MAIKUROMETORU.

Claim 28] The material of the aforementioned ferroelectricity catholyte is PZT. Or cathode-ray tube according to aim 25 characterized by being PLZT.

Claim 29] The material of the aforementioned ferroelectricity catholyte is PZT. Or cathode-ray tube according to aim 26 characterized by being PLZT.

Claim 30] The material of the aforementioned ferroelectricity catholyte is PZT. Or cathode-ray tube according to aim 27 characterized by \*\*\*\*\* by PLZT.

Claim 31] The thickness of the aforementioned ferroelectricity catholyte is 1. Cathode-ray tube according to claim 25 aracterized by being a range in the micrometer or 100 micrometers.

Claim 32] The thickness of the aforementioned ferroelectricity catholyte is 1. Cathode-ray tube according to claim 26 aracterized by being a range in the micrometer or 100 micrometers.

Claim 33] The thickness of the aforementioned ferroelectricity catholyte is 1. Cathode-ray tube according to claim 27 aracterized by being a range in the micrometer or 100 micrometers.

Claim 34] The thickness of the aforementioned ferroelectricity catholyte is 1. Cathode-ray tube according to claim 28 aracterized by being a range in the micrometer or 100 micrometers.

Claim 35] The thickness of the aforementioned ferroelectricity catholyte is 1. Cathode-ray tube according to claim 29 aracterized by being a range in the micrometer or 100 micrometers.

Claim 36] The thickness of the aforementioned ferroelectricity catholyte is 1. Cathode-ray tube according to claim 30 aracterized by being a range in the micrometer or 100 micrometers.

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## DETAILED DESCRIPTION

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### Detailed Description of the Invention]

[001]

The technical field to which invention belongs] this invention relates to the electron gun and cathode-ray tube which applied the cathode structure and this which applied the ferroelectricity emitter which is applied to the electron gun and cathode-ray tube which applied the cathode structure and this which applied the ferroelectricity emitter, especially uses ferroelectricity emitter as a source of electron emission.

[002]

Description of the Prior Art] The cathode structure generally used for a cathode-ray tube emits an electron from cathode matter like Ba oxide excited thermally. Such the cathode structure is equipped with the heat source for heating the cathode matter, for example, a filament, and is divided into a direct heat type and the radiated type of heat by the heating method of the cathode matter by the filament.

[003] In order for the thermoelectron emitted from the electron gun to progress to a screen actively and to prevent degradation of the cathode matter by the ion bombardment, the interior of a cathode-ray tube must maintain the state of high vacuum.

[004] Generally, in the manufacture process of a cathode-ray tube, it passes through a series of manufacture process, such as the so-called exhaust air process and an aging process, so that a thermoelectron may be smoothly emitted from the cathode matter.

[005] However, in the former, the trouble of the cathode matter deteriorating by the ion bombardment which considerable time generates in process this top was in exhaust air and the aging process.

[006]

Problem(s) to be Solved by the Invention] It is made in order that this invention may solve the above conventional troubles, and the purpose is in offering the electron gun and cathode-ray tube which applied the cathode structure and this to which degradation of the cathode matter by the ion bombardment applied the few ferroelectricity emitter also under the state of a low vacuum.

[007] Moreover, other purposes of this invention are easy to manufacture, and structure is offering the electron gun and cathode-ray tube which applied the cathode structure and this which applied the easy ferroelectricity emitter.

[008]

Means for Solving the Problem] In order to attain the aforementioned purpose, the cathode structure by this invention substrate, the lower electrode layer formed on the aforementioned substrate, and the ferroelectricity catholyte formed in the aforementioned lower electrode layer, It is characterized by providing the drive electrode which controls the electron which is formed on the aforementioned ferroelectricity catholyte, is formed on the up electrode layer which offers the electron emission field from the front face of a ferroelectricity catholyte, and the aforementioned electrode layer, and is emitted from the electron emission field of the aforementioned up electrode layer.

[009] In order to attain the aforementioned purpose, moreover, the electron gun by this invention In the electron gun possessing the source of electron emission, the electrode group possessing the electrode of a large number which control and accelerate the electron from the aforementioned source of electron emission, and the aforementioned source of electron emission and the support means which support and fix the aforementioned electrode group The ferroelectricity catholyte by which the aforementioned source of electron emission is formed on a substrate, the lower electrode layer formed on a substrate, and the aforementioned lower electrode layer, It is characterized by providing the drive electrode which controls the electron which is formed on the aforementioned ferroelectricity catholyte, is formed in the up electrode layer which offers the electron emission field from the front face of a ferroelectricity catholyte, and the aforementioned electrode layer, and is emitted from the electron emission field of the aforementioned up electrode

yer.

010] In order to attain the aforementioned purpose, moreover, the cathode-ray tube by this invention In the cathode-ray tube possessing the source of electron emission, the electron gun possessing many electrodes, the funnel possessing a neck section equipped with the aforementioned electron gun, and the panel possessing the screen which realizes a picture with the electron beam from the aforementioned electron gun The lower electrode layer by which the aforementioned source of electron emission is formed on a substrate and the aforementioned substrate, The ferroelectricity catholyte formed on the aforementioned lower electrode layer, and the up electrode layer which is formed on the aforementioned ferroelectricity catholyte and offers the electron emission field from the front face of a ferroelectricity catholyte, It is characterized by providing the drive electrode which controls the electron which is formed on the aforementioned electrode layer and emitted from the electron emission field of the aforementioned up electrode layer.

011] the passage which it is desirable to prepare the three aforementioned electron emission fields and to acquire three electron beams for color picture realization in the aforementioned this invention, and an electron passes especially the aforementioned drive electrode -- it is desirable to prepare a hole

012] Moreover, as a material of the aforementioned ferroelectricity cathode, it is PZT. Or it is desirable to apply any one of PLZT(s).

013]

Embodiments of the Invention] Hereafter, based on the drawing which appended this invention, it explains still in detail.

014] It is 120 when drawing 1 for explaining the fundamental concept of the cathode structure of this invention is referred to. It is the ferroelectricity catholyte of the source of electron emission, and is 110. 130 It is a vertical electrode layer for exciting a ferroelectricity catholyte.

015] Lower electrode layer 110 Up electrode layer 130 When the high-pressure pulse of a sub-microsecond is impressed, it is the ferroelectricity catholyte 120. It comes to switch spontaneous polarization to the interior and a front face, and discharge of a strong electron is caused. Here, an electron is emitted from the outcrop grade in which an up electrode is not formed.

016] It is a substrate 100 when drawing 3 which shows the cross section of drawing 2 which shows the rough perspective diagram of the cathode structure by the materialized this invention, and drawing 2 is referred to. It is the lower electrode layer 110 of the least significant to a front face. The catholyte 120 which was formed and applied the ferroelectricity emitter on it, the up electrode layer 130, an insulating layer 140, and drive electrode layer 150 It is formed one by one.

017] The above cathode structures of structure have three electron emission fields so that it may be used for a color cathode-ray tube. Concretely, it is the aforementioned up electrode layer 130. Lower electrode layer 110 One is prepared at a time, respectively and it is the ferroelectricity catholyte 120. The whole can be excited now.

018] The aforementioned insulating layer 140 Upwards, they are three drive electrode layers 150. A fixed interval is separated and it is prepared. and each drive electrode layer 150 \*\*\*\* -- breakthrough 151 for electron emission and control It is formed. Here, it is each aforementioned drive electrode layer 150. Each breakthrough 151 The aforementioned corresponding up electrode layer 130 Since the micropore 131 for discharge of a thermoelectron is formed in the part as shown in drawing 4, this is led, and an electron is the aforementioned drive electrode layer 150. breakthrough 151 It progresses.

019] The aforementioned drive electrode layer 150 Control signals, such as a picture signal, are received, and it determines whether emit an electron or not, and the amount of electron emission is controlled.

020] It sets to the cathode structure of this invention of this structure, and is the aforementioned ferroelectricity catholyte 120. As a material, PZT well-known as the ferroelectric substance, PLZT, etc. are used. Moreover, the aforementioned up electrode layer 130 And lower electrode layer 110 As a material, high conductivity metals, such as aluminum, gold, and platinum, are used.

021] Moreover, it is the aforementioned ferroelectricity catholyte 120 as a result of an experiment. The driver voltage for making a shell electron emit is 100. When it has the low pulse potential below a bolt, it turns out that electron emission with it happens. [ there is little leakage of current and stable ] Especially driver voltage is dependent on the material state of a ferroelectricity catholyte, for example, a crystal phase, thickness, etc. of material. According to the experiment, it is the voltage of a driving pulse 100 In order to lower to below a bolt, it is the ferroelectricity catholyte 20 130,110, for example, the thickness of PLZT, i.e., a vertical electrode layer. It is necessary to set the interval of a between as 10 micrometers or less.

022] Although it becomes lower as the catholyte of driver voltage is thin, since the short circuit between vertical

ectrode layers will occur if it becomes about 1 micrometer or less, you have to become 1 micrometers or more. Moreover, driver voltage is dependent also on the diameter of the breakthrough formed in the size, i.e., drive electrode layer, of an electron emission field. According to the experiment, it is 300. After carrying out to below [AIKUROMETORU, it is 100 gradually. Stable electron emission became possible in the state below a bolt. )023] The manufacture method of the cathode structure of this invention of the above structures is as follows. )024] Substrate 100 which consists of glass ceramics as shown in drawing 5 After forming a golden paste in a front face in print processes first, only a predetermined time is made to plasticity-ize, and it is the lower electrode layer 110. obtains.

)025] lower electrode layer 110 PZT pasted as shown in drawing 6 when completed or form PLZT by print processes by the thickness of 20 micrometers, and pass a plastic process again -- ferroelectricity catholyte 120 It forms.

)026] As shown in drawing 7, it is the aforementioned ferroelectricity catholyte 120. The laminating of the golden paste is turned in print processes up, plasticity of this is carried out, and it is the up electrode layer 130. It forms. Under the present circumstances, up electrode layer 130 Pattern 131, i.e., many micropores, as shown in drawing 4 It has.

)027] If an insulating layer 140 and the drive electrode layer 150 are formed using print processes as shown in drawing 8, the desired cathode structure will be obtained. Here, it is the aforementioned insulating layer 140. Drive electrode layer 150 The aforementioned up electrode layer 130 Micropore 131 It has a corresponding breakthrough.

)028] Moreover, in order to manufacture the cathode structure by this invention, methods other than the print processes mentioned above can also be used. For example, after coating this unilateral side with an electrode layer, holding of this is carried out in acrylic resin, and after polishing other sides by predetermined thickness, it is made to adhere to a substrate in formation of an electrode layer, after manufacturing a ferroelectricity sheet in the shape of bulk, in order to be also able to apply the sputtering method, a doctor blade method, etc. and to form a ferroelectricity catholyte.

)029] Drawing 9 shows the rough side structure of the electron gun of this invention where the cathode structure of this invention was applied.

)030] This electron gun 900 The cathode structure 190 which had and mentioned the one main lens above, the control electrode G1, the screen electrode G2, and focal electrode G3 and an accelerating electrode G4 are located in a line in order, and these are the glass beads 800. It is combined with one. 820 It is the aforementioned glass bead 800 about the cathode structure of \*\*\*\*\*. It is a fixed piece for making it fix, and such a fixed piece can be changed into various forms.

)031] As mentioned above, the electron gun by this invention has the structure where the radiated type cathode structure of the source of thermionic emission of heat was exchanged by the cathode structure of this invention, in the structure of a single electron gun of having the single main lens.

)032] For drawing 10, it is the drawing in which the cathode-ray tube by this invention possessing the electron gun of this invention mentioned above was shown roughly, it sets to the cathode-ray tube of the existing structure, and the electron gun of the conventional structure is the electron gun 900 of this invention. It has the structure taken and replaced.

)033] Overall structure is an electron gun 900. It is built and is a deflecting yoke 320 to the periphery. Neck 310 prepared Funnel 300 which it has It is a screen 410 to an inside side. Formed panel 400 Cross coupling is carried out and one vacuum housing is constituted. Screen 410 of the aforementioned panel 400 In the position by which shell predetermined distance isolation was carried out, it is a shadow mask 420. Inside shield 440 It is prepared and these are panels 400. Frame 430 currently fixed It is supported.

)034] Although it came to pass through the exhaust air for optimizing the cathode structure, and the aging process when the assembly of the cathode-ray tube of this invention which has the above structures was completed, in the case of the cathode-ray tube by this invention, exhaust air and the aging process were completed within only 2 hours to taking about 4 hours in the case of the cathode-ray tube which applied the conventional cathode structure. Moreover, according to the experiment, the cathode structure was not spoiled even if it lowered the degree of vacuum at the time of exhaust air the single step grade from the conventional cathode-ray tube.

)035]

Effect of the Invention] By applying a ferroelectricity catholyte, exhaust air and an aging process are simplified technically, therefore the cathode-ray tube by this invention serves as a low cost. In order not to use a heat source like a filament moreover, the cost of parts falls, and thermal deformation of the element which adjoined the cathode structure and this especially by the heat source can be suppressed. Moreover, since the electron emission method is performed by the momentary pulse, discharge of a thermoelectron is performed quickly.

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

Drawing 1] Drawing having shown the cathode structure by this invention roughly.

Drawing 2] The perspective diagram having shown the cathode structure by this invention roughly.

Drawing 3] The cross section of the cathode structure by this invention shown in drawing 2.

Drawing 4] The up electrode of the cathode structure by this invention shown in drawing 2 is an expansion plan a part.

Drawing 5] Work process drawing of the cathode structure by this invention.

Drawing 6] Work process drawing of the cathode structure by this invention.

Drawing 7] Work process drawing of the cathode structure by this invention.

Drawing 8] Work process drawing of the cathode structure by this invention.

Drawing 9] The outline cross section having shown one example of the electron gun by this invention to which the cathode structure of this invention was applied.

Drawing 10] The outline cross section of the cathode-ray tube by this invention to which the electron gun of this invention was applied.

### [Description of Notations]

00 Substrate

10 Lower Electrode

20 Ferroelectricity Catholyte

30 Up Electrode

31 Micropore

40 Insulating Layer

50 Drive Electrode Layer

51 Breakthrough

90 Cathode Structure

00 Funnel

10 Neck

20 Deflecting Yoke

00 Panel

10 Screen

20 Shadow Mask

30 Frame

40 Inside Shield

00 Glass Bead

20 Fixed Piece

00 Electron Gun

11 Control electrode

12 Screen electrode

13 Focal electrode

14 Accelerating electrode

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Translation done.]